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Interim Specifications for OR and M Grant, Contract and In-House Reports

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A final report is required for all research, development, and demonstration grant, contract, and in-house projects supported by the Office of Research and Monitoring (OR&M), Environmental Protection Agency (EPA). Final reports shall be prepared by the performing organization and shall have standard covers, size, and format. These specifications are provided for this purpose and are to be followed by all EPA research components, the performing organization, the Project Officer, and all key personnel involved in the preparation of final reports. In addition to the obvious categories -- final reports on in-house, grant and contract research -- they are also intended to apply to annotated bibliographies, review documents, and methods manuals.

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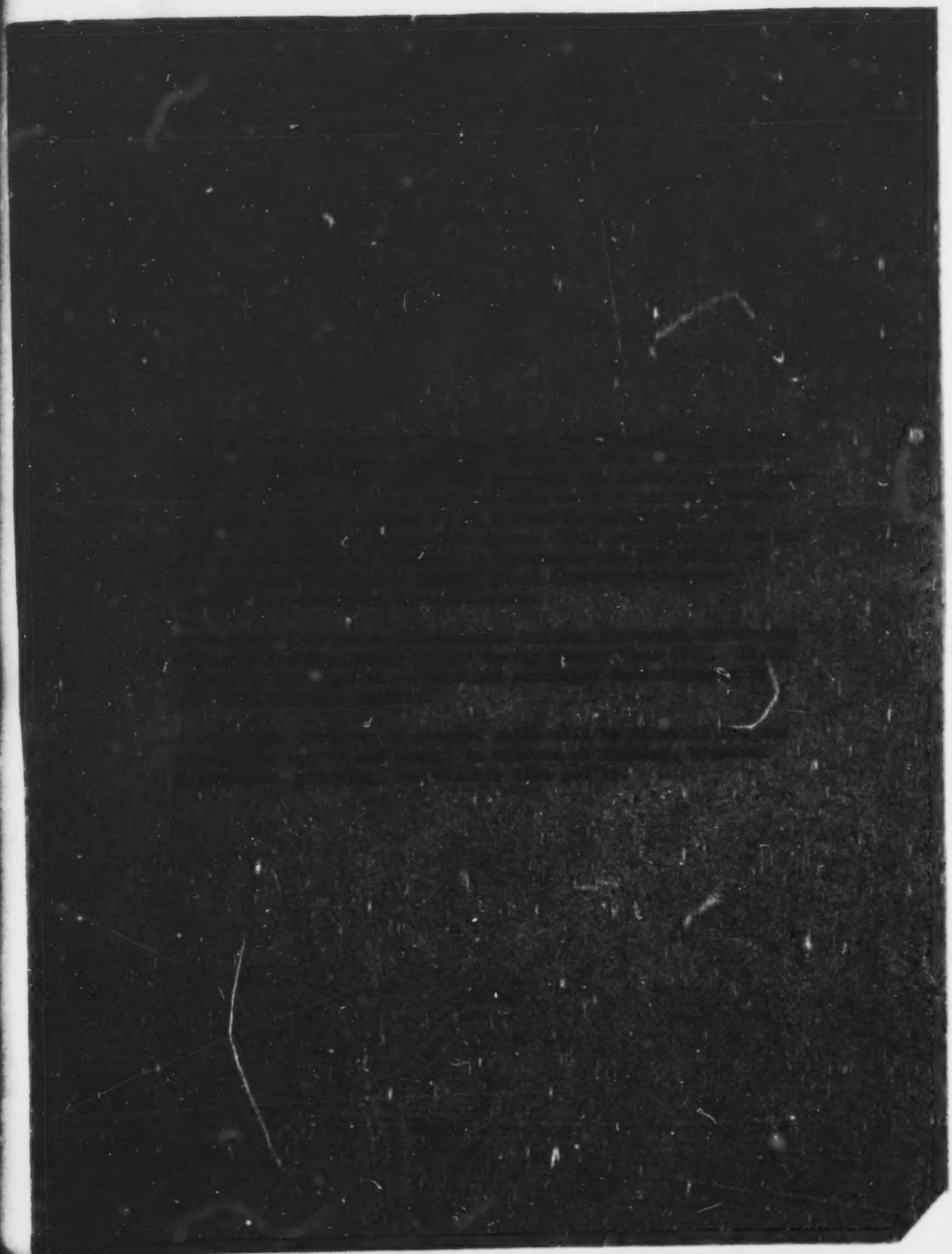

INTERIM

SPECIFICATIONS FOR OR&M

GRANT, CONTRACT AND IN-HOUSE REPORTS

MARCH 1973

by

Publications Branch
Research Information Division

Office of Research and Monitoring
U.S. Environmental Protection Agency
Washington, D.C. 20460

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INTERIM SPECIFICATIONS FOR OR&M GRANT, CONTRACT, AND IN-HOUSE REPORTS

I. INTRODUCTION

A final report is required for all research, development, and demonstration grant, contract, and in-house projects supported by the Office of Research and Monitoring (OR&M), Environmental Protection Agency (EPA). Final reports shall be prepared by the performing organization and shall have standard covers, size, and format. These specifications are provided for this purpose and are to be followed by all EPA research components, the performing organization, the Project Officer, and all key personnel involved in the preparation of final reports. In addition to the obvious categories -- final reports on in-house, grant and contract research -- they are also intended to apply to annotated bibliographies, review documents, methods manuals, etc. It is essential that each person carry out his own responsibilities so that the end product will be a final report of high quality and appearance.

Any deviation from these specifications must be approved by or through the Project Officer. Major deviations require a waiver for special handling obtained from the Publications Branch.

These specifications are intended to apply to any final report resulting from OR&M sponsored/conducted research, and are applicable regardless of whether the final report is submitted as a single manuscript or as a specified quantity of printed documents. The form of submission and/or number of copies of this obligated report is stated in the final agreement (grant or contract). When the final report is complete and approved, the grantee or contractor shall submit the reproducible manuscript (or printed copies if so specified) to his assigned Project Officer. In the case of in-house reports, local procedures will be followed for handling of the reproducible manuscript. One copy of all published OR&M research reports is to be furnished the Publications Branch.

A. General Requirements

The purpose of these specifications is to provide uniformity in research reports prepared at the conclusion of each grant, contract or in-house project which is initiated through the OR&M EPA. Because of the diversity of these programs, and the geographic dispersal of the monitoring National Environmental Research Centers (NERCs), these specifications will not contain

review and coordination procedures. These issues are subject to existing local practice and the administrative channels may be vulnerable to reorganizations; therefore, these matters will be addressed through other directives.

To insure dissemination outside of EPA, all OR&M/EPA reports are announced and made available at the Government Printing Office and/or the National Technical Information Service (NTIS). In addition to the NTIS processing requirements, there are many EPA reporting functions which have been instituted so that mechanical restrictions must be regarded. These realities justify such constraints as prohibition of sub-scripts, super-scripts, non-english letters, or special characters in titles and abstracts.

Theses for advanced degrees from educational institutions are not acceptable as final reports, unless prepared in accordance with these specifications.

B. Report Contents

The final report shall contain all useful information, results, and data acquired in the performance of the work done under the project. It shall explain the work conducted in such detail as to allow others to reproduce the work, equipment, and processes and shall present all significant results, together with conclusions and recommendations derived therefrom.

C. Outside Responsibility

In order to protect potential patent and invention rights of the agency and/or the author, Project Officer concurrence is required prior to disclosure of information pertaining to grant and contract projects. The grantee or contractor shall not release copies of his final report for any use until the final report has been approved and accepted by the OR&M, EPA. Pursuant to review of the draft final report, the Project Officer should advise the Office of General Counsel, EPA, whether, in his opinion any inventions have been made during the project.

D. Reproduction

The reproduction of EPA reports received will vary with several factors which include the subject matter, an estimate of potential audience, the scope and magnitude of the project, and the size of the report. These factors affect the decision as to appropriateness of publication and the most economic method

of reproduction. The most prevalent decision wi'l be to utilize the Government Printing Office or one of its designated contractors, and use an offset printing method from final page size negatives. Local OR&M office procedures will dictate the method to be followed for reproducing and distributing reports.

II. RESEARCH AND MONITORING REPORT SERIES AND NUMBER ASSIGNMENTS

(NOTE: The following applies to original report manuscripts, as well as pre-printed reports furnished by grantees and contractors.)

In order to classify the reports of the Office of Research and Monitoring, five series have been established. These five broad categories aid in program management and are expected to facilitate the distribution, information retrieval, and usage of the resulting publications. These series as described herein, cover the range of all environmental research and monitoring activities:

1. Environmental Health Effects Research
2. Environmental Protection Technology
3. Ecological Research
4. Environmental Monitoring
5. Socioeconomic Environmental Studies

Each research report prepared for work conducted or monitored by the Office of Research and Monitoring under a program element will be assigned to one of these series. Scope notes defining the series, along with corresponding report colors, and program element number assignments to them follow.

These programs are identified by the 1973 title of the Program Element along with the 1973 Program Element (PE) number. Since the majority of these programs are continuations or consolidations of prior program elements, corresponding PE numbers for 1972 are also shown. Program Planning and Budget (PPB) numbers are also provided for the cases where these program numbers may be still applicable. Since program titles have been evolving greater reliance must be placed on numerical precedents. This listing is intended to enable the assignment to the appropriate series of all research reports for programs which were initiated in prior years and for which documentation is now being produced.

A. Series Descriptions

1. ENVIRONMENTAL HEALTH EFFECTS RESEARCH - (yellow covers)

This series describes projects and studies relating to the tolerances of man for unhealthful substances or conditions. This work is generally assessed from a medical viewpoint, including physiological or psychological studies. In addition to toxicology and other medical specialities, study areas include biomedical instrumentation and health research techniques utilizing animals - but always with intended application to human health measures.

2. ENVIRONMENTAL PROTECTION TECHNOLOGY - (light blue covers)

This series describes research performed to develop and demonstrate instrumentation, equipment and methodology to repair or prevent environmental degradation from point and non-point sources of pollution. This work provides the new or improved technology required for the control and treatment of pollution sources to meet environmental quality standards.

3. ECOLOGICAL RESEARCH - (light green covers)

This series describes research on the effects of pollution on humans, plant and animal species, and materials. Problems are assessed for their long- and short-term influences. Investigations include formation, transport, and pathway studies to determine the fate of pollutants and their effects. This work provides the technical basis for setting standards to minimize undesirable changes in living organisms in the aquatic, terrestrial and atmospheric environments.

4. ENVIRONMENTAL MONITORING - (gray covers)

This series describes research conducted to develop new or improved methods and instrumentation for the identification and quantification of environmental pollutants at the lowest conceivably significant concentrations. It also includes studies to determine the ambient concentrations of pollutants in the environment and/or the variance of pollutants as a function of time or meteorological factors.

5. SOCIOECONOMIC ENVIRONMENTAL STUDIES - (rust covers)

This series describes research on the socioeconomic impact of environmental problems. This covers recycling and other recovery operations with emphasis on monetary incentives. The non-scientific realms of legal systems, cultural values, and business systems are also involved. Because of their interdisciplinary scope, system evaluations and environmental management reports are included in this series.

(NOTE: The applicable series description paragraph shown above will be incorporated on the inside front cover of each report. See sample page.)

B. Program Element Identification by Series

1. Environmental Health Effects Research Series - HE

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	110201	1A1005	Community Health Effects Surveillance Studies (CHESS)
	110203	1A1007	Biomedical Research
18010 18040 18070	310201 310205 310208	1B1019	Water Quality Health Effects Research
	410200	1D1052	Environmental Effects Research
	510101 510201	1E1078	Pesticides Health Effects Research
	610201	1F1081	Radiation Epidemiological Research
	610202 610203 610204	1F1082	Radiation Health Effects Research
	610205	FX1106	AEC Radiation Effects Program
	710201	1H1092	National Center for Toxicological Research
	710207	1H1098	Comprehensive Planning, and Institutional and Social Systems Research
	-	1H1099	Toxic Substance Health Effects Research

2. Environmental Protection Technology Series - PT

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	110101	1A1001	Pollutant Characterization
	110102	1A1002	Fuel and Fuel Additive Registration
	110401	1A1010	Instrumentation and Analytical Methods Development
	121101	1A2012	Particulate Control
	121102 121103	1A2013	SO(x) Control
	121104	1A2014	NO(x) Control
	121105	1A2015	Control Technology - Other Pollutants
	121106	1A2016	Land Use Planning and Transportation
16060	310302	1B1024	Fate of Pollutants in Ground Waters
16070	310303	1B1025	Fate of Pollutants in Marine Waters
16120	310304	1B1026	Fate of Pollutants in Large Lakes
16020 16030 16040	310401 310402 310403	1B1027	Methods Development for Identification of Pollutants
	-	1B1032	Thermal Pollution Research
11010	320101	1B2033	Municipal Sewered Discharge
1102-	320102	1B2034	Combined Sewer Overflows and Storm Water Discharges

PT - Continued

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
1103-	320103	1B2034 Ctd.	
1104-	320104		
11050	320105	1B2035	Non-Sewered Domestic Wastes
13050	323105		
12010	321101	1B2036	Heavy Industrial Sources
12020	321102		
12030	321103		
12050	321105		
12070	321107		
12090	321109		
12110	321111		
12130	321113		
16130	328204		
12040	321104	1B2037	Food, Paper, and Other
12060	321106		Industrial Sources
12080	321108		
12100	321110		
12120	321112		
15020	322101	1B2038	Transportation Sources
13010	323101	1B2039	Agricultural Sources
13020	323102		
13030	323103		
13040	323104		
15010	323106		
15060	323107		
14010	324101	1B2040	Mining Sources
14020	324102		
14030	324103		
14040	324104		
14050	324105		
15090	326101	1B2041	Oil and Hazardous Materials
15080	326102		Spills

PT - Continued

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
15030	322102	1B2042	Hydrologic Modification
15070	322103		
-	327100		
15110	720101		
17010	328101	1B2043	Treatment Process Development and Optimization
17020	328102		
17030	328103		
17040	328104		
17050	328105		
17060	328106		
17070	328107		
17080	328108		
17090	328109		
17100	328110		
17110			
16100	328202	1B2044	Cold Climate Waste Treatment
16080	328203	1B2045	Water Quality Control
	421125	1D2063	Processing Methods
	421126	1D2064	Disposal Methods
	421127	1D2065	Systems Management
	421128	1D2066	Specialized Municipal Wastes
	421122	1D2067	Storage, Collection and Transportation Methods
	421123		
	421124		
	422121	1D2069	Industrial Waste Classification
	422123	1D2070	Industrial Waste Management Strategies
	423121	1D2072	Agricultural Solid Wastes
	423122		
	424121	1D2075	Recycling

PT - Continued

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	424122	1D2076	Resource Recovery Inducement
	510402	1E1079	Pesticides Identification Methodology
	710101	1H1091	Standards Research
	710205	1H1096	Modeling and Methodologies Development
	710206	1H1097	Environmental Studies Centers
	710207	1H1098	Comprehensive Planning, and Institutional and Social Systems Research
	730301	1H2101	Technology Transfer

3. Ecological Research Series - ER

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	110103	1A1003	Regional Air Pollution Study (RAPS)
18030	110202	1A1006	Ecological Impact of Air Pollution
	110302	1A1008	Formation and Decay of Pollutants
	110301 110303	1A1009	Meteorological Research
	310204	1B1020	Agricultural Uses
18050	310206	1B1021	Freshwater Fishes, Other Freshwater Life and Wildlife
18090	310209	1B1022	Marine Fishes, Other Marine Life, and Wildlife
16050	310301	1B1023	Fate of Pollutants in Fresh Surface Waters
16060	310302	1B1024	Fate of Pollutants in Ground Waters
16070	310303	1B1025	Fate of Pollutants in Marine Waters
16120	310304	1B1026	Fate of Pollutants in Large Lakes
	-	1B1028	Great Lakes Research
	330801	1B1030	Water Quality Implementation Research
16010	328201	1B1031	Eutrophication and Lake Restoration
	410300	1D1053	Environmental Phenomena Research

ER - Continued

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	423121 423122	1D2072	Agricultural Solid Wastes
	510102	1E1077	Pesticides Ecological Effects Research
	510302	1E2080	Alternative Methods of Pest Control
	610301	1F1083	Radiation Pathways Research
	610302	FX1107	AEC Animal Investigation Program
	710101	1H1091	Standards Research
	710202	1H1093	Systems Evaluation
	710204	1H1095	Environmental Indicators
	710204	1H1098	Comprehensive Planning and Institutional and Social Systems Research
	-	1H1100	Toxic Substance Ecological Effects Research

4. Environmental Monitoring Series - EM

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	110103	1A1003	Regional Air Pollution Study (RAPS)
	110302	1A1008	Formation and Decay of Pollutants
	110301 110303	1A1009	Meteorological Research
	-	1A1011	Standardization of Instrumentation and Analytical Methods - Air
	-	1A1108	Fuel and Fuel Additive Surveillance
	-	1B1028	Great Lakes Research
	-	1B1029	Lake Survey
	-	1B1109	Standardization of Methods for Identification of Pollutants - Water
	410300	1D1053	Environmental Phenomena Research
	410400	1D1054	Measurements and Analytical Methods Research
	510301	1E1110	Pesticide Exposure Surveillance
	610402	1F1084	Radiation Methods and Measurements
	-	1F1111	Radiochemical Measurements
	710101	1H1091	Standards Research
	710204	1H1095	Environmental Indicators
	710207	1H1098	Comprehensive Planning, and Institutional and Social Systems Research

5. Socioeconomic Environmental Studies Series - SE

PPB	PROGRAM ELEMENT 1972	PROGRAM ELEMENT 1973	TITLE
	110104	1A1004	Economic Criteria
	121106	1A2016	Land Use Planning and Transportation
16090 16110	330801	1B1030	Water Quality Implementation Research
15030 15070 - 15110	322102 322103 327100 720101	1B2042	Hydrologic Modification
	-	1D1312	Behaviorial and Systems Studies of Solid Waste
	-	1D1315	Benefits of Solid Waste Management
	421127	1D2065	Systems Management
	424121	1D2075	Recycling
	424122	1D2076	Resource Recovery Inducement
	710101	1H1091	Standards Research
	710202	1H1093	Systems Evaluation
	710203	1H1094	Economics Research
	710204	1H1095	Environmental Indicators
	710205	1H1096	Modeling and Methodologies Development
	710206	1H1097	Environmental Studies Centers
	710207	1H1098	Comprehensive Planning and Institutional and Social Systems Research

C. Numbering System

All publications are numbered in accordance with a 5-element format. A sample number might be: EPA-R2-73-007b

EPA Identifies all Environmental Protection Agency publications. This element is invariant.

R2 Identifies the OR&M series of publications. The initial R is used for all Research and Monitoring publications. The numeric is a designator to the established series as given below.

Series	Designator	Cover Color
Environmental Health Effects Research	1	Yellow
Environmental Protection Technology	2	Light Blue
Ecological Research	3	Light Green
Environmental Monitoring	4	Gray
Socioeconomic Environmental Studies	5	Rust

73 Indicates (the last two digits of) the year of publication.

007 Indicates the serial number which is: (1) sequentially assigned, and (2) normally a pure numeric. This serial number may be assigned on a non repetitive basis, but they will normally be annually recycled.

b Indicates an expander to the serial number element. This attached element is applicable only for limited situations: if a report is published in multiple volumes, or is scheduled for periodic supplements, an alphabetic suffix (a to z) is appended. The sample report number contains a b suffix to indicate it is the second in a separate sequence or set. This provision keeps reports in "sets" yet retains the integrity of the general numbering system.

For reports which are being completed at the end of a calendar year, the year of actual or planned date or release to printing or reproduction determines the year (third) element of the number. The year of start or finish of the work described is not significant in setting this element.

When a report is published periodically, a new serial number is normally assigned with the first issue of the new calendar year. An explanatory note within the report refers to previous number(s) of prior year(s).

Control

To prevent duplicate report numbers and maintain integrity, all report numbers are assigned by the Publications Branch, Research Information Division (703/557-7706). It is the responsibility of the OR&M author (or the Project Officer in case of contract or grant reports) to contact or call this office for a report number assignment. Assignments are sequentially provided and recorded in separate series logs. This number is not to be requested until the publication has been approved. If the publication is withdrawn prior to reproduction and/or distribution, the recipient of the report number must notify the Publications Branch of the cancellation.

III. REPORT CONTENT

A typical final report shall contain the following sections. (Approved style samples of report pages are included herein.)

1. Front Cover - prepared by EPA. Type size and other printing details will be determined by the EPA Printing Officer or publication representative, depending on facilities available to him. All report covers will contain the following items:

   a) Report number
   b) Report series title
   c) Report title - 10 words or less
   d) Sub-title (or sub-series) when appropriate
   e) Date of publication (month/year)
   f) Cooperating or co-sponsoring agency(s) when appropriate
   g) OR&M/EPA agency identification
      (1) In the case of contracts and grants: Office of Research and Monitoring, United States Environmental Protection Agency, Washington, D.C. 20460.
      (2) In the case of in-house projects: the Center (NERC), Office of Research and Monitoring, United States Environmental Protection Agency, and the city, state and zip code of the Center.

2. Inside Front Cover - prepared by EPA. The inside front cover shall contain two items: series notes and disclaimer notice.
   a. The series notes contain the series description for the series cited on the front cover and any other group notation. Parochial or unique messages which peculiarly apply to the report which follows are restricted. The text of these series descriptions appear in Section II (A) of these specifications.
   b. The disclaimer paragraph is standard in being appropriate for all research reports. The disclaimer shall appear as follows:

      "This report has been reviewed by the Office of Research and Monitoring, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use."

3. Title Page - This page shall contain only the following items:

a) Report number - upper right-hand corner; added by Project Officer, who obtains the number from the Publications Branch after report has been reviewed and cleared for publication.
b) Date of publication (month/year)
c) Report series
d) Report title
e) Sub-title (or sub-series) when appropriate
f) Personal author(s)
   (1) In the case of contract and grant reports printed through the Government Printing Office, the corporate affiliation of personal authors is not listed. This limitation is due to a ruling by the U.S. Joint Committee on Printing, that identification of the performing organization is construed as advertising, and is not allowed.
   (2) In the case of in-house reports, personal authors shall be listed, as well as the EPA NERC or Laboratory name and location.
g) Contract, grant, or project number as appropriate
h) Program Element number
i) Name and address of Project Officer (or primary EPA contact); this citation with extramural work will provide identification of the EPA individual with closest knowledge of the described work. Some projects are subdivided and primary liaison with grantee or contractor is handled by a Task Officer(s).
j) Administering NERC - for in-house reports only
k) Cooperating or co-sponsoring agency(s) when appropriate
l) OR&M/EPA agency identification
   (1) In the case of contracts and grants, add Washington, D.C. 20460.
   (2) In the case of in-house reports, add city, state, and zip code of the NERC.

(See following summary and footnotes of information elements on report covers and title page.)

SUMMARY OF INFORMATION ELEMENTS FOR REPORT COVERS AND TITLE PAGES

Item		Cover		Title Page	
		In-house	Extramural	In-house	Extramural
1.	Report Number	x	x	x	x
2.	Series Title[2]	x	x		
3.	Report Title	x	x	x	x
4.	(Sub-title or Sub-series)[3]	(x)	(x)	(x)	(x)
5.	Personal Author(s)			x	x
6a.	Corporate Author (where appropriate) Including Address[4]				x
6b.	NERC Element[5] Including Street Address			x	
7a.	Contract/Grant Number (GAD Number)				x
7b.	Project Number			x	x
7c.	Program Element Number			x	x
8.	Project Officer				x
9.	Date of Publication[6]	x	x	x	x
10.	"Prepared For"				x
11.	NERC[7]	x		x	
12a.	OR&M	x	x	x	x
12b.	U.S. EPA	x	x	x	x
13.	Address	x[8]	x[9]	x[8]	x[9]
14.	(Cooperating and Co-sponsoring Agencies)[10]			(x)	(x)

FOOTNOTES

1 Front covers will vary between in-house and extramural reports only by differences in elements indicated. Mutual elements will appear in a consistent style and position. Back covers will be identical. Covers will be color coded as prescribed for the series.

2 Five document series with corresponding cover color codes have been established. Each report cover will be identified with one of the following series:

Series	Color
Environmental Health Effects Research	Yellow
Environmental Protection Technology	Light Blue
Ecological Research	Light Green
Environmental Monitoring	Gray
Socioeconomic Environmental Studies	Rust

3 Items included in parentheses are to be included only when applicable. Reports which are serially or periodically produced on a given program will be enumerated or identified as such.

4 The corporate author address on the title page will contain street address, city, state, and postal zip code when not prohibited by regulations of the Government Printing Office.

5 The NERC element for intramural programs will be the division or laboratory of the Center where the work was performed. The address which follows on the title page will be a complete mailing address including author(s) organizational unit.

6 The date shall be written as "month year" (e.g. January 1973) and shall indicate the date the report was sent to reproduction with all approvals.

7 This is the Center, even though the project monitor might be or have been located in a satellite laboratory or other field site.

8 For in-house research, the cover contains only city, state and zip code of the Center; the title page also contains this basic address. Note that this is in addition to above; the author or principal investigator (item 5) is followed by his full address (item 6b).

9 For extramural research, the EPA address on both the cover and title page always will be Washington, D.C. 20460. This is irrespective of PED and Project Monitor location and reflects the sponsoring Office of Research and Monitoring location.

10 When an EPA research project receives major support from other governmental agencies, the project is termed as a cooperative effort. When an EPA research project receives major support from a private organization, the project is termed as a co-sponsored effort. The second organization is also identified appropriately on the title page. These definitions exclude support from other sources through any number of lesser ways. For these cases, appropriate acknowledgements are recognized in an acknowledgment section of the report.

4. Abstract - the abstract page shall follow the title page and be a maximum of 200 words. An abstract is a shortened version containing or referring to essential parts of the original document. The abstract shall indicate the purpose and scope of the work undertaken, the work performed, results obtained and conclusions. Factual detail is not appropriate. The purpose of the abstract is to provide the reader with useful information and with a means of determining whether the complete document should be obtained for study. Because of the subsequent processing of abstracts for bibliographic purposes, avoid usage of non-english or special characters and inferior or superior figures (subscripts, formulas etc). The last paragraph shall be as follows: "This report was submitted in fulfillment of (Project Number and Contract/Grant Number) by (contractor or grantee organization) under the (partial) sponsorship of the Environmental Protection Agency. Work was completed as of (date)."

5. Table of Contents - one page if possible

6. List of Figures - this is an optional item where there are less than five illustrations.

7. List of Tables - this is an optional item where there are less than five tables.

8. Acknowledgements - only this section shall contain acknowledgements of key personnel and organizations who were associated with the project.

9. Conclusions - use clear, concise statements to summarize conclusions reached in the course of this project.

10. Recommendations - use clear, concise statements to state recommended future action.

11. Body of Report
    a. Introduction - scope and purpose of the project, general background of the project and description of the various phases of the project. The theoretical approach to the solution of the problem being attacked should be included in this section.
    b. Design, Construction or Experiment Fabrication Phase and/or materials and methods.
    c. Operational and Evaluation Phase or Experimental Phase.

d. Discussion - detailed description and analysis of the work performed during the course of the project. Identification of innovations or development of new techniques or processes should be included. Where appropriate, discussion of cost projections and economic analyses should appear here.

12. References - use consistent references which are full citations to work referenced throughout the report and references to closely related work, background material, and publications which offer additional information on aspects of the work. An option of the author is to list these at the end of the chapter with citation, or list together in a separate section following the body of the report.

13. List of inventions reported and publications - if any inventions have been reported, or publications, or pending publications have been produced as a result of the project, the titles, authors, journals or magazines and identifying numbers which will assist in locating such information should be included in this section.

14. Glossary of terms, abbreviations, and symbols - when more than five of these items are used in the text of the report, prepare a listing of all with explanations and definitions. It is expected that every abbreviation and symbol will always be defined on its first appearance in the report with a parenthesized symbol. The total count of employed symbols and abbreviations in report text does not consider entries in Tables or callouts and legends in Figures which should be self-contained.

    Measurements in EPA/OR&M reports will be expressed in metric units; however, for the convenience of engineers and other scientists accustomed to using the British system, values may be given in British units as well in parentheses after the value in metric units. The expression of measurements by both systems of units is especially encouraged for engineering reports.

15. Appendixes - related or additional material too bulky or detailed to include within the Discussion portion of the report. The appendixes shall be made a part of the report with consecutive page numbers. If the appendixes are too large for inclusion in the report, they shall be bound as

a separate document with separate page numbers. The Project Officer shall determine how appendixes are to be included in the final report. If a report has only one appendix it is titled "APPENDIX." If a report has more than one appendix each is designated with a capital letter (APPENDIX A, APPENDIX B) and page numbers are still continuations of the body of the report.

16. NTIS/WRSIC Forms - All OR&M research reports are forwarded to and announced by the National Technical Information Service for demand distribution. Copies are sold in microfiche form as well as hard copy. In order to accomplish this, NTIS requires a completed Bibliographic Data Sheet. However, reports in the area of water pollution control research are processed for NTIS through the Water Resources Scientific Information Center (WRSIC). Therefore, so-called "water reports" require a WRSIC Input Transaction Form in lieu of the NTIS Bibliographic Data Sheet.
    (a) NTIS Bibliographic Data Sheet - The originator of the report is responsible for completion of this form which shall be completed and included with the manuscript, and shall be the last separate, printed page of the report. Forms are available from the Project Officer or NTIS.
    (b) WRSIC Input Transaction Form - This abstract shall be prepared by the author and included as the last separate, printed page of the report. Forms and required material are available from the Project Officer or from WRSIC. The completed form is included with the report manuscript.

    For any reports prepared prior to these instructions and pre-printed by a contractor or grantee ("water" as well as "non-water"), three copies of such reports, along with the appropriate completed NTIS or WRSIC form shall be submitted by the Project Officer to a designated point for forwarding to NTIS according to local program procedures. Pre-printed reports submitted to NTIS shall have an EPA series number assigned in accordance with previous instructions. In the case of non-water pre-printed reports, a copy of the completed NTIS Bibliographic Data Sheet shall be forwarded to the Publications Branch.

    In order to maintain complete and current records, the Publications Branch must be notified of the assigned accession (PB) number for all reports when received from NTIS by means of the NTIS orange accession notice card (NTIS Form 79). Receipt of this number is critical for purposes of announcement and bibliographic records, as well as answering availability inquiries.

17. Back cover - prepared by EPA. Back covers will have provision to accept a mailing address. The EPA return address identification will be that of the initial distribution point. Block for address changes will also be provided. (See sample). Upper right cover will contain franking information for Postal Service permit, and bulk rate information when applicable.

18. Binding - Reports containing over 96 pages require a spine strip which will include the report number and title. Print size shall be scaled to match width of spine. A spine is not used, of course, for small reports (less than 96 pages) bound with saddle stitching.

IV. SPECIFIC FORMAT REQUIREMENTS

1. Prepare report for a final size of 8 x 10-1/2 inch page copy with an image area of 6 x 8-1/2 inches. Since draft manuscripts for OR&M reports may be submitted on a page size of either 8 x 10-1/2 or 8-1/2 x 11, the margins are not specified. Although photographic methods can be used to vary final dimensions or reductions, these specifications are written to avoid the necessity of dimensional reductions for normal text pages. The advantages of more data per page (oversize), and reducing down to the prescribed 6 x 8-1/2 image area is offset by requirements of equipment flexibility and concern for retained legibility or print size of copy. This is further discussed under following paragraphs, but print size should not be below 8-point type for most cases or 6-point type under extreme circumstances.

2. The draft final report may be double-spaced (or space and a half, if desired) on one side only. The use of space and a half typing may minimize retyping of report manuscript to final format, for cases where the draft is essentially approved as first submitted. This draft shall be submitted to the Project Officer in its entirety, including illustrations, appendixes, etc. Upon the Project Officer's approval, type the final report manuscript single-spaced (or space and a half, if desired) on one side of the page. This is the <u>original</u> or reproducible master of the final report. In preparing this final manuscript, use a high-quality typewriter, a black typewriter ribbon, and a good bond paper.

3. Center page numbers at bottom of page after a skipped line so the page number is separated from last line of text by a quarter inch or more. All front matter pages shall be numbered consecutively using lower case Roman numerals, as follows:
   Title page, i (unnumbered);
   Abstract, ii (numbered);
   Table of Contents, iii (numbered);
   Continue numbering through Acknowledgments.

   Arabic numbers are used for text, beginning with page 1 (right-hand page) on Section I, Conclusions and numbered consecutively to the end of the report. Reports will be printed on both sides of the paper. Although new sections begin on a new page, they will be printed on the next available page. Therefore, blank pages will be minimized. Use capitalized, centered headings for designating the principal sections of the report.

4. You are not required to number all paragraphs. While such style does assist in cross-referencing it has the disadvantage of inducing too much formality into the communication. To maintain good compactness in OR&M reports a block style of paragraph structure is suggested. Heading order and style are as follows:

   1st order (chapter beginnings) - All capital letters centered on the page one and a half inches down from the top edge of the image area. Double-space if more than one line. Set bottom line three spaces above 2nd-order heading or text.

   2nd order - All capital letter set flush with left margin and two spaces above paragraph.

   3rd order - Capital and lowercase letters set flush with left margin and two spaces above paragraph. Third-order headings are underlined.

   4th order - Capital and lowercase letters set flush left with left margin, underlined, and followed with a dash.

   5th order - Initial capital letter on first word only and on other proper nouns and followed by a dash. Text follows on the same line.

5. To reduce the literary style of the report and improve the communication of results, a direct style of expression is recommended. This choice of approach will eliminate some formal touches such as footnotes. If the material being footnoted cannot be smoothly incorporated in the text, the preferred technique is to treat as a reference and refer to the source of the material. When neither alternate technique is applicable, footnote designation may be incorporated in the following order: *, +, ‡, and **. Footnotes are typed flush left at the bottom of the page with single spacing. A two inch rule from the left margin separates the footnote from the text.

6. Prepare Tables and Figures in consistent style throughout the report. Tables and Figures shall be numbered consecutively (with Arabic numbers) and appropriately captioned. All Figures and Tables including captions and titles should be prepared to fit an image area of 6 x 8-1/2 inches. If figures and tables are too large to reduce to 8 x 10-1/2 inch page size with proper margins, they can be presented on facing pages, i.e., left side on even numbered page, right side on odd-numbered

page. Caution should be used to avoid excessive reductions which would produce unacceptable legibility. Foldouts should be held to a minimum. Figures and tables shall appear in the text as the subject is discussed, not grouped at the end of the section. The following instructions will promote consistently clear and informative illustrations. Illustrations are to be no larger than the 6 x 8-1/2 inch image frame. Although oversized illustrations may be included in drafts or milestone reports, they must be reduced to page size when submitted with the final report.

A. Graphs: Axis lines must be drawn with a No. "0" pen. Tick marks 0.2 inch long are spaced around the inside of the axes. Curves must be drawn with at least a No. 2 pen. If tapes are used, 1/32-inch-size tapes are required. Lettering must be at least 10 points in height. Ordinate and abscissa descriptive labels are in all capital letters and are followed by a comma; units of measure in lower-case letters. Callouts within the frame of the graph are in all-capital letters except for chemical and mathematical symbols.

B. Drawings: Lines should be No. "0" or thicker. All call-outs are in all capital letters with the same exceptions as noted for graphs. Illustrations should be kept simple to assure legibility and uncomplicated reproduction. Avoid using dot patterns and screens if the work is to be reduced. If screens are used, they should be the lighter shades. Avoid using any mass of black on any illustrations.

C. Halftones (Photographs): Captions for photos should be typed on the proper text page. Indicate proper approval and credit citations if illustrations are taken from another source; i.e., "Courtesy of _____." Do not submit slides, overlays, or transparencies. Have callouts (arrows) applied to isolate particular features of interest when applicable.

Color illustrations should not be used unless absolutely necessary. In such cases, when the report is to be printed by EPA, approval for the use of color material must be obtained before the manuscript is submitted for printing. To accomplish this prior approval, a letter justifying the use of color must be written to the EPA Printing Officer requesting approval. Full specifications and a "dummy" should be provided. Upon receipt of such

approval, the manuscript is then submitted for printing, along with a copy of the letter of approval. This approval is necessary only when Government printing is involved.

Black and white half-tone photographs should be submitted as glossy prints to readily reproduce with good clarity. Clearly identify on the reverse of the photo, the figure number and page number on which the photo is to be used as well as photo positions (indicate "top, bottom"). Do not paste photos on text, nor use staples or paper clips. Submit all photos collectively in a separate envelope, with all photos clearly identified. A photo may be cropped to eliminate unwanted areas. These prints should be mounted with crop marks indicated on the margin of the mount.

Photographs shall be retouched as necessary to bring out all parts in perfect clarity. Retouching includes correcting tone values, sharpening details, and removing undesirable portions of the illustration. Disturbing background details are removed by airbrushing, using an even tone that will keep the subject well separated from the background.

D. Figure Titles: Titles are set with initial capital letter on first word only, except for proper nouns and chemical or mathematical symbols requiring capitals.

7. Tabulated data should be presented in a systematic style. When data tables are formalized as specified below, titles of all tables and their page number will be given in prefatory page, List of Tables.

A. Proportion: Tables are to be composed, if possible, in 6 x 8-1/2 inch proportion so that if reductions are necessary, the table will reduce proportionally to the same size as all the other pages.

B. Title: The title is centered above the table. The word "Table" has an initial capital letter only. The table number is followed by a period and two spaces. The table title is typed in all capital letters, except when alteration would change the meaning, e.g., chemical and mathematical terms, and units of measure.

If data in a table are all in the same units, the units should be designated in lowercase letters in parentheses

centered beneath the title.

Table 1. COAL CONSUMPTION IN NORTH CAROLINA
(tons/year)

If an explanatory subtitle is needed, it should be typed in capital-and-lowercase style under the main title.

C. Spacing: Double-space between title and table. Separate the title and table with a double line. Scan information in the table to determine the space needed for the longest item, and plan the column width accordingly.

D. Headings: Build headings from the base line under the heading requiring the most vertical space. Headings are to be initial capital letter on first word only. Units are to be set off with a comma and centered under the column heading. Table style is shown as follows:

Center heading base line

Table 7 (continued). FIELD NOTES ON HORSES SAMPLED

Site	Horse	Mane color	Age, yr	Time at site,[a] yr	Comments
8	Bay mare	Black	12	5	Here in summer, out in winter.
8	Bay mare	Black	3		Always in corral, eats home-grown hay.
9	Roan mare	Brown	7-8	5-6	Stifled.
9	Bay gelding	Black	17-20	5-6	
10	Black and white mare	Black	10	2-3 mo	Eats hay from Site 8.

no side lines

single line

[a] Years unless otherwise indicated.

E. Treatment of data: If the information in the tables consists of words or phrases, use initial capital letter on first word only. Type flush left. The second line of a phrase in the left-hand column should be indented two spaces.

When the item description in the left-hand column occupies

two lines type tabular data in columns opposite the first line.

If a table contains columns of numbers, type whole numbers centered in the column, but flush right with respect to each other. If the numbers are whole numbers and decimals, line up with the decimal point. Put zeros in front of decimal points for all numbers less than one.

F. Table footnotes: Designate footnotes in tables with lowercase letters -- a,b,c, etc., -- after and superior to data: 6,320.[a] Footnotes are typed flush left and may extend the full width of the table. Single-space between footnotes.

8. Equations and formula which require any special symbols, positioning or brackets should be treated as figures and appear on separate lines in the text. Do not use hand-lettered notations, but normally have them prepared with other graphs as a figure.

A. Short expressions: Short mathematical expressions or equations can be treated as a part of the text when it is convenient to do so, but the following suggestions should be considered:

1. Do not break a short equation in text at the end of a line. Space out the line so that the equation will begin on the next line; or better, center the equation on a line by itself (that is, display the equation).

2. For convenience in line spacing, use the solidus instead of the horizontal bar in fractions appearing in text. This method requires only a single line of type; for example,

$$1/(a + b) \quad \text{rather than} \quad \frac{1}{a + b}$$

3. If short equations are numbered, display them, regardless of length.

4. Center on the width of the page any single-line equation that can be confined horizontally to one line; allow at least one and a half lines above and below the highest and lowest characters.

B. Breaking an equation: The most appropriate method for breaking an equation that is too long for one line depends on the material involved, but the following general rules should be considered:

1. Divide an equation or mathematical expression before the equal sign if the left-hand and right-hand members (that is, the characters to the left and right of the equal sign) are not awkwardly different in length.

$$I_x W_x + h_x + W_y W_x (I_z - I_y) + W_y H_z - W_z H_y$$
$$= + \left[\frac{3 g_o R^2}{r^3}\right]\left(I_x \sin^2\theta - I_y + I_z \cos^2\theta\right) \quad \phi \cos\theta + \frac{P}{2} u^2 S l_x C_y + m_x$$

2. Divide an equation or mathematical expression before a plus or a minus sign if the left-hand and right-hand members vary greatly in length.

$$y = a \sin 2nt + b \cos 2nt + c \sin 4nt + d \cos 4nt + e \sin 7nt + \cos 6nt$$

3. Set flush on the left any equation that is too long for one line, and set flush on the right the second half of the equation; the two parts should balance as nearly as possible.

4. Avoid breaking an equation within a pair of inclusion signs (parentheses, brackets, or braces); if this cannot be avoided, break before an operational sign.

$$\left[(m+2) - 2(m+4)\,\alpha_1\right] \quad \Big\{(m+5)\,(\alpha_3 - 1) \quad \left[(m+3)\,(m+4)\,\alpha_1\alpha_2 - (m+2)\,(m+4)\,(\alpha_1 + \alpha_2) + (m+2)\,(m+3)\right]$$
$$+ \left[(m+4)\,(m+5)\,\alpha_1 + \alpha_2 - (m+2)\,(m+5)\,(\alpha_1 + \alpha_2) + (m+2)\,(m+3)\right]\Big\} = 0$$

5. Before breaking an equation, check the material before a sign of aggregation, an integral sign, or a summation sign; the preceding material cannot always be separated from the sign.

C. Equations in series: Align two or more equations in series on the equal signs and center on the longest equation in the group.

$$D = \frac{501.5R_2 + 556.5R_3 + 611.5R_4 + 664.5R_5}{W}$$

$$D = \frac{5,624,322.5 + 5,890,552.5 + 6,292,335 + 6,591,685}{55,430}$$

$$D = \frac{24,398,895}{55,430}$$

$$D = 439.958$$

D. Horizontal alignment: Align the following with the center of the equal sign: the horizontal bar of a simple fraction or a built-up fraction, a minus sign, and the horizontal bar of a plus sign.

Align all subscripts and superscripts for a given line; type all at one time to assure proper alignment.

E. Built-up fractions: For uniformity, if a built-up fraction occurs in one part of an equation, build up all other fractions in that line.

F. Enclosing mathematical expressions: Use parentheses, brackets, and braces--in this order--to enclose a part of a mathematical expression used as a unit. (Exceptions are made to this order of introduction when special mathematical meaning is indicated, such as matrices, functions, and limits.) The referenced mathematical signs should be at least the same height as the mathematical expressions that they enclose. The integral and summation signs should be slightly larger than the expressions that they introduce.

G. Numbering equations: Equations are to be numbered consecutively with Arabic numerals in the order of their

presentation in the report. A single numbering sequence is to be used throughout the report, to include the appendixes. Do not begin a new sequence with new sections or in appendixes.

The equation number is enclosed in parentheses and placed at the right-hand margin, normally aligned with the last line of the equation. If the equation is too long to allow at least one half inch space before the equation number, the number may be typed by itself on the next line. Equations grouped by a brace are identified by a single number, which is typed opposite the center point of the brace.

H. Notation of symbols: When it is necessary to define symbols used in an equation, the word "where" is placed flush with the left margin at least one and one half inch below the lowest character in the equation, and the first definition is placed at least two spaces to the right on the same line; the remaining entries are typed on subsequent lines and are aligned according to the equal sign.

$$D = \frac{1}{2} \rho V^2 C_d S$$

where D = drag, lb

ρ = density, slugs/ft^3

V = velocity, ft/sec

C_d = drag coefficient

S = reference area, ft^2

9. Incorporate a bibliographic style that is consistent in style and format. References are cited in the text by superscript Arabic numbers, e.g., Jones and Smith,[4] and may be carried at the end of each chapter or at the end of the document. References are numbered consecutively in text and are listed in order of appearance in text. Preferred bibliographic style is delineated on the following pages.

A. Journal articles: (Journal articles entries should be in the following order.)

(1) Author's last name, comma, initials, period. If more than one author, regular initials and surname order for those other than the first author. If several authors, use comma before and; follow author entry with period.
(2) Title should be in upper- and lowercase style. Follow with period. If title is in a foreign language, follow with English title in brackets.
(3) Name of Journal* - City where journal is published should be listed in parentheses after journal name if the journal is foreign. Follow with period.
(4) Volume number of journal should be cited and underscored. If the issue number does not correspond with the month of the year (e.g., May = 5), the issue number should be listed in parentheses after the volume number. Follow with a colon.
(5) Page Numbers -- Immediate after colon, inclusive page numbers are given. Separate them with hyphen. Follow with a comma.
(6) Date -- Give month and year without a separating comma. Follow with a period.

Example:

Smith, E. A., R. A. Jones, and A. T. Brown. Effects of Air Pollution on Painted Surfaces. Aust Chem Process (Sidney). 22:17-21, January 1969.

Notes:

If any element is missing, order should be as above, but without the missing entry.

B. Books:

(1) Author(s) name -- same treatment as for journal articles. Follow with period.

(2) Title -- same treatment as for journal article titles. Edition, follow with period.

*Abbreviations of the names of periodicals are to follow the style as listed in the ACS Handbook for Authors, available from American Chemical Society, 115 Sixteenth Street, N.W., Washington, D.C. 20036.

(3) Place of Publication -- use city name. Follow with comma.
(4) Name of Publisher. Follow with comma.
(5) Date, year. Follow with period.
(6) Pages cited -- Whole book: 500 p.
Chapter: p. 321-347
Page: p. 336.

Example:

Smith, A. R. Air Pollution in Urban America. Chicago, U. of Chicago Press, 1963. 316 p.

C. Part of Books or Proceedings:

(1) Author -- same treatment as for journal article. Follow with period.
(2) Title of article or Chapter. Follow with period.
(3) In: Book Title. Follow with comma.
(4) Follow with editor's last name, initials, and (ed.). Follow with period.
(5) Place of Publication -- use city name. Follow with comma.
(6) Name of Publisher. Follow with comma.
(7) Date, year. Follow with period.
(8) Pages -- p. 321-327 or 333. End with period.

Example:

Doe, J. C. Air Pollution from Stockyards. In: Air Pollution in United States, Kiercynski, Y. Z. (ed.). Kansas City, Livestock Publishers, Inc., 1962. p. 312-316.

D. Reports:

(1) Author -- same treatment as for journal article.
(2) Title -- same as for journal article. If no author, start citation with title.
(3) Source -- name of company, institution, or government agency. If a contractor - sponsor relation exists, identify the performing organization. Follow with period.
(4) Location of Publisher. Follow with period.
(5) Report Number. Follow with period.
(6) Issuing agency or (co)sponsoring organization which issued report. Follow with a period.
(7) Date. Follow with period.
(8) Pages Cited or Total Pages. Follow with period.

Example:

James, L. P., J. T. Frederick, and P. J. Williams. Air Pollution Measurements by Various Orthodox Methods in Certain Urban and Non-urban Locations at Specific Times. Environmental Protection Agency, Raleigh, N.C. Publication Number AP-485. July 1971. 185 p.

E. Reprints:

Same treatment as that for journal articles.

F. Preprints:

(1) Author -- same treatment as others. Follow with period.
(2) Title -- same treatment as others. Follow with period.
(3) Source or Author's Affiliation. Follow with period.
(4) Name of Meeting. Precede with parenthesis. Preface name of meeting with statement of relation such as "Prepared for" or "Presented at". Follow meeting name with period.
(5) Place of Meeting. City only. Follow with period.
(6) Date of Meeting. Exact date. Follow with period, then parenthesis.
(7) Number of pages. Follow with period.

Example:

Smith, R. F. Air Pollution in River Basins. Riverview University. (Presented at Annual River Basin Preservation Society Meeting. Riverview Heights. June 5-9, 1972.) 4 p.

G. Laws or Regulations:

(1) Governmental Entity.
(2) Title of Act or Law, if there is a name.
(3) Associated Title, Act Number, Section Number, or Paragraph identification.
(4) Place of Publication.
(5) Publisher.
(6) Date.
(7) Pages.

Example:

5 USC, Freedom of Information Act, Sec 552(b) (1967)

10. Use the metric system of measurements. Because of traditional practices in engineering as opposed to scientific fields, the equivalent units in the British system (feet, acres, pounds, etc.) may be given in parenthesis following the metric units in the text of reports.

    Use recognized abbreviations for units following a numerical quantity. Do not use a period after abbreviations unless they spell a word. For example: two commonly used units, in. and gal., do require periods. Abbreviations must be consistent in their use throughout the report including those on Figures and Tables. Greek letter or other symbols must be typed or printed, not handwritten.

    The first usage of an abbreviation in the text should include the written out form followed by the abbreviation in parenthesis. When a report is so long or technical that more than five abbreviations are involved, not including tabular data, headings, or callouts on illustrations, then include a glossary of abbreviations preceding any appendix(es).

11. For general editorial advice refer to the Government Printing Office Style Manual. There are a number of widely recognized alternate authorities. One example is: The Handbook for Authors of Papers in the Journal of the American Chemical Society. These are guides to grammatical usage, preferred spellings, and typing of technical information. The Handbook should also be consulted for the use of hyphens, italics, and numbers and mathematical expressions.

    Abbreviations, symbols, and units should conform to the style and usage set forth in the Handbook. The International System of Units should be used; however, in those few instances in which ACS usage differs from international usage, ACS style should be followed. Symbols for chemical elements, ions, nuclides, and particles should conform to ACS style.

    Whenever possible, use chemical names of pharmacological compounds. When these names are unwieldy, generic names may be used. Avoid use of trade names insofar as possible. Other chemical nomenclature should conform to recommendations of the International Union of Pure and Applied Chemistry (IUPAC), the National Academy of Sciences, and respective ACS committees on nomenclature.

For advice on the preparation of reports in the bio-medical sciences, consult the Style Manual for Biological Journals* and leading journals, such as the American Journal of Physiology, Journal of Bacteriology, and the New England Journal of Medicine.

*Available from American Institute of Biological Sciences, 3900 Wisconsin Avenue, N.W., Washington, D.C. 20016.

V. RESPONSIBILITY CHECKLIST

It is essential that the responsibility of report preparation be recognized by the grantee or contractor who originates a final report. At the same time, it is essential that the Project Officer and other EPA key personnel carry out their responsibilities also, in order to eliminate unnecessary review and change.

In order to summarize these responsibilities, the following checklist shall be used during the processing of a final report.

*1. Contractor or Grantee - Prepare draft final report and submit to Project Officer in required number of copies.

*2. Project Officer

a. Review draft final report to see that it conforms to applicable final report specifications. Makes certain title of report is 10 words or less.
b. Forward a copy of the draft report to the cognizant Program Element Director (PED), or the cognizant Program Element Manager (PEM) at Headquarters if there is no PED, for review and approval.

*3. Program Element Director or Manager - Review draft final report and prepare comments as requested by Project Officer within 30 days of receipt of copy.

*4. Project Officer - Return draft to contractor/grantee with approval to prepare deliverable document(s) with required corrections as specified in contract/grant award.

5. Contractor or Grantee- Prepare reproducible final report manuscript with other required deliverables and submit to Project Officer.

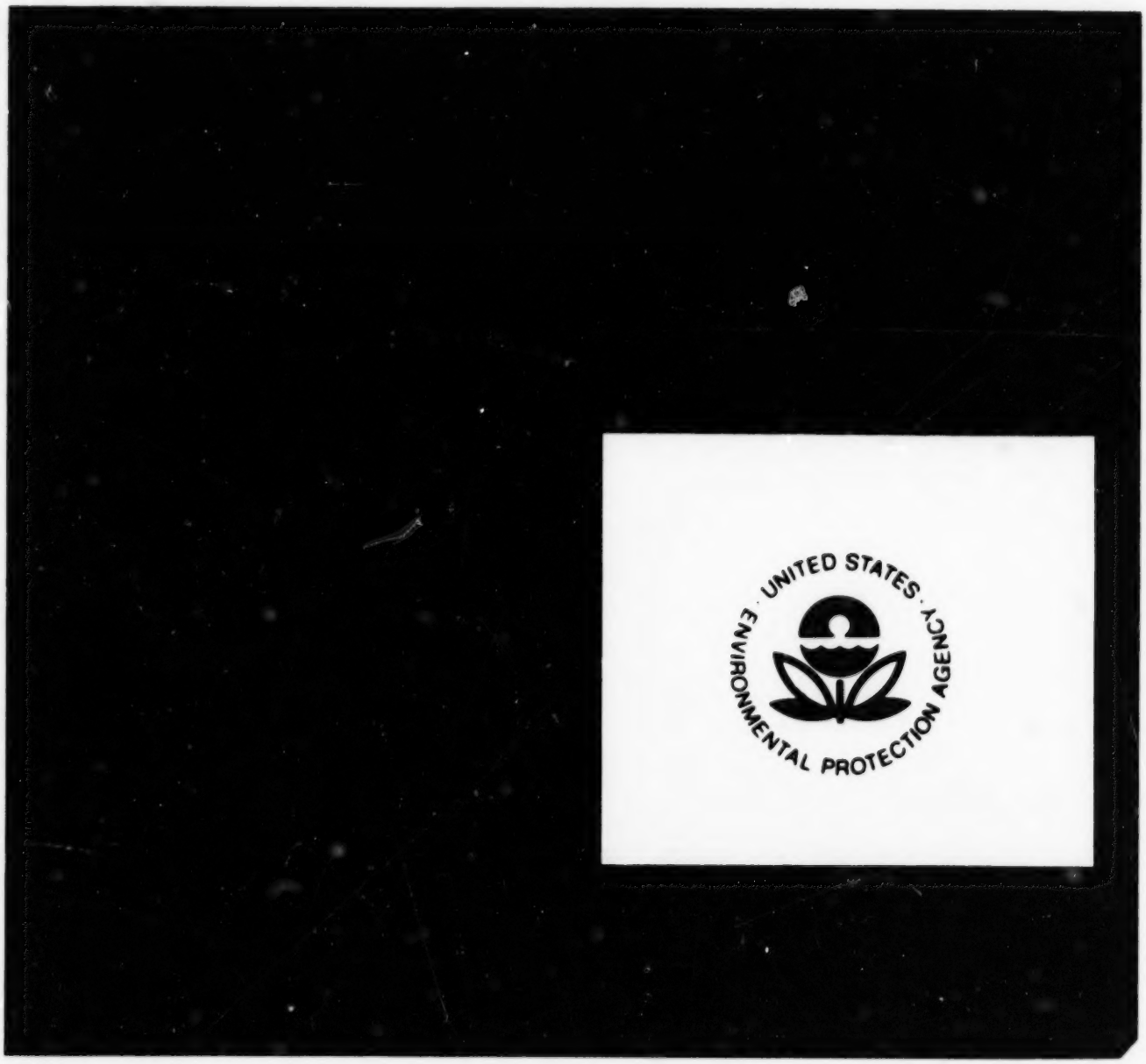
6. Project Officer - Review final report manuscript for compliance with corrections and if acceptable, 1) determine the series; 2) secure a report number; and 3) enter it in the upper right-hand corner of the title page of the final manuscript. Forward manuscript to proper point for preparation of covers and final printing of report. For cases where a number of reports are to be delivered, these covers may need to be preprinted as an EPA furnished item and forwarded to the bindery for assembly with copies of text.

7. Project Officer - In the event that a completed final report manuscript is deemed unsatisfactory for regular publication and distribution, the Project Officer is to obtain the concurrence of the proper Program Element Director (or other program authority) not to publish the report. Alternate authority may be established to assist in this decision based on limited interest, redundancy of results, possible operational/administrative problems, etc. associated with the project. In this event, the Project Officer shall prepare a memorandum stating that the report shall not be published but that it shall be forwarded to NTIS for limited accessibility. In this case, he shall forward three (preferably the original and two copies) copies of the report to the proper point for submission to NTIS. These copies must be accompanied by a completed NTIS Bibliographic Data Sheet or WRSIC Input Transaction Form. In addition, he shall also forward a copy to the EPA Library System.

* NOTE: Steps 1 through 4 are omitted for Section 5 (Class I) research grants to educational institutions.

EPA-R4-72-001a
January 1972

Environmental Monitoring Series



RESEARCH REPORTING SERIES

Research reports of the Office of Research and Monitoring, Environmental Protection Agency, have been grouped into five series. These five broad categories were established to facilitate further development and application of environmental technology. Elimination of traditional grouping was consciously planned to foster technology transfer and a maximum interface in related fields. The five series are:

1. Environmental Health Effects Research
2. Environmental Protection Technology
3. Ecological Research
4. Environmental Monitoring
5. Socioeconomic Environmental Studies

Standard paragraph for all reports.

This report has been assigned to the SOCIOECONOMIC ENVIRONMENTAL STUDIES series. This series describes research on the socioeconomic impact of environmental problems. This covers recycling and other recovery operations with emphasis on monetary incentives. The non-scientific realms of legal systems, cultural values, and business systems are also involved. Because of their interdisciplinary scope, system evaluations and environmental management reports are included in this series.

Add specific series description as appropriate

SAMPLE

EPA REVIEW NOTICE

This report has been reviewed by the Office of Research and Monitoring, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Standard

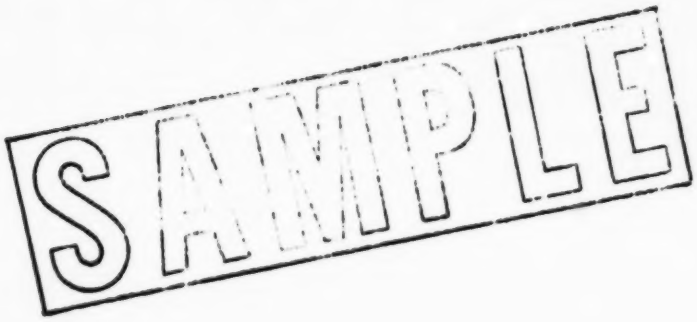
SAMPLE INSIDE FRONT COVER

EPA-R2-73-005a
February 1973

WORKBOOK OF THERMAL PLUME PREDICTION

Volume I

Submerged Discharge



by

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Program Element 1B1032

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February 1973

REVIEWS OF CURRENT LITERATURE ON ANALYTICAL METHODOLOGY AND QUALITY CONTROL

No. 4

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ABSTRACT

This report presents the development and successful demonstration of quantitative design methods for preliminary design of water quality surveillance systems. It includes a comprehensive set of quantitative design procedures in handbook form for use within the existing capabilities of governmental water quality agencies. The quantitative methods are intended for use in design of monitoring systems that satisfy an abatement objective. Preliminary design is that portion of the design process that deals solely with the interface between the surveillance system and the monitored system, the river basin. The preliminary design includes specification of station locations, sampling frequencies, and priorities. Incorporation of such practical engineering concerns as cost, reliability and maintainability, and computerization of the procedure are recommended areas for additional development.

The methods are based on a systems approach, in which the performance of the total surveillance system is evaluated as a whole. A new method for establishing sampling frequency is developed, based on a unique formulation of the sampling design problem. The development incorporates a "macroscopic" concept that limits consideration of time and space dimensions to scales compatible with an overview of the river basin. Data availability remains a constraint of the method, even under the "macroscopic" concept; methods are developed for estimation of required design data.

The quantitative preliminary design methods are demonstrated to function satisfactorily on the Wabash River Basin. It is concluded that the methods incorporated in the User Handbook represent an acceptable method for use by governmental water quality agencies under the existing constraints.

This report was submitted in fulfillment of Project Number 16090 HOJ, Contract Number 68-01-0144, by the Raytheon Company, Environmental Systems Center, under the (partial) sponsorship of the Environmental Protection Agency. Work was completed as of August 1972.

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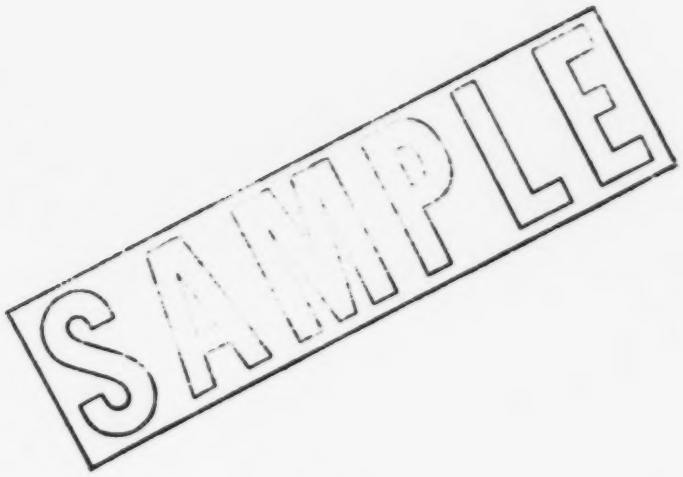
ACKNOWLEDGMENTS

The support of the Mayor of the City of Erie, Pennsylvania, Honorable Louis J. Tullio, is acknowledged with sincere thanks. Mr. Paul Cygan, Chief, Bureau of Sewers of Erie, provided valuable assistance.

The construction and operation of the pilot plant, the bench scale studies, analytical work and report preparation was performed by a team from Hammermill Paper Company consisting of Dr. R. W. Brown, Dr. C. W. Spalding, and Mr. R. M. Ludwig.

The EPA Region I personnel at Needham Heights, Massachusetts supported the project through use of their STORET terminal and contribution of their experience in surveillance.



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SECTION I

CONCLUSIONS

Excessive infiltration into sewer lines displaces valuable sewer capacity, increases collection system maintenance costs, increases sewer plant operating costs and increases the pollution in our streams and waterways.

A chemical blocking method employing acrylamid gels is currently being used to seal leaking sewers with its success limited by the sealant's lack of strength and other physical limitations.

Four epoxy-based sealants and two urethane-based sealants developed in the reported program can result in strong, permanent repairs.

The new sealants are suitable in conditions of erratic infiltration where the acrylamid gels fail due to repeated dehydration.

Equipment for applying the new sealants can be designed to cost about the same as existing equipment; however, existing equipment for applying sealant can be modified to accept the new sealants.

The new sealants do not significantly increase the cost of sealing sewers since the major cost of sealing leaks is in the mechanics of finding and sealing them, not in the cost of the sealants used.

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SECTION II

RECOMMENDATIONS

This program was limited to the laboratory study and development, and scaled-up testing, as described elsewhere in this report. It was not within the scope of the program to fully develop the new sealants through full-scale, long-term testing in sewers or under the exact chemical, biological or physical conditions existent in sewers. It is recommended, however, that such field testing be carried out.

In such a program, specially designed equipment recommended and generally described elsewhere in this report should be designed and fabricated, utilized in the testing, and evaluated and re-designed as needed.

Testing of the new sealants, implaced by the newly developed equipment in actual sewers, would permit long-term evaluation of repairs made, and a program to incorporate such testing is recommended.

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It should be noted, however, that by utilizing existent equipment, properly modified, the new sealants can be used now, and their use is recommended when 1) strength is needed to hold against high head pressures, 2) flexibility is needed to allow for shifting soils, 3) wide spaces or gaps need to be bridged, and 4) when ambient external conditions alternate frequently between wet and dry. It is suggested, however, that the new sealants be applied only under conditions of low or no infiltration until further testing can determine the effects of inflow on the sealing and curing process.

SECTION III

INTRODUCTION

GENERAL

Activities related to alleviating pollution of our groundwater resources may be divided into two categories: (1) those activities designed to stop pollution now taking place, and (2) those activities to rehabilitate ground-water reservoirs which have already become polluted. Although this project deals primarily with rehabilitation, it is hoped that the costs of the remedial measures presented and the real economic damage caused by such pollution will stimulate considerably greater efforts by state and federal agencies in the preventive category.

This project deals with the pollution of a valuable shallow ground-water aquifer by the disposal of oil-field brine through first an unlined "evaporation" pit and later through a faulty disposal well. Although the use of unlined "evaporation" pits (which should be called seepage pits) is now outlawed in some states and some rules have been adopted regarding salt-water disposal wells, still considerable pollution is taking place because of the lack of sufficient surveillance and enforcement. This report examines in detail a singular occurrence of such pollution and the costs involved in rehabilitation. If rehabilitation steps are not undertaken, the polluted ground water will spread and eventually discharge into the Red River, an interstate stream.

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LOCATION

The project is in Miller County in the southwest corner of Arkansas, see figure 1. The sources of the brine pollution are a disposal pit and a disposal well located in the SW 1/4 of the SE 1/4 of Section 14, Township 16S, Range 26W, which is about 2 1/2 miles southwest of the town of Garland City and 2 1/2 miles west of the Red River.

This particular polluted area occupies about one square mile and affects the west half of that part of the alluvial floodplain on the west side of the Red River. The flood plain is flat, productive farmland, which lies 222 feet about sea level at the project area.

OBJECTIVE

The original objective of this project was to develop selective pumping techniques whereby a fresh-water aquifer, which had become

SECTION IX

REFERENCES

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SAMPLE

SECTION X

LIST OF INVENTIONS

(If any inventions have been reported, or publications, or pending publications have been produced as a result of the project, the titles, authors, journals, or magazines and identifying numbers which will assist in locating such information should be included in this section.)

SECTION XI

GLOSSARY

Adaption - Any change in an organism which increases its fitness to the environment.

Autocatalytic Inhibitor - An inhibitor produced in the death phase of microorganisms which when applied to fresh viable microorganisms causes them to produce more of the inhibitor and induces death.

Autotrophic - Needing only inorganic compounds for nutrition.

Bacterial Reduction - A decrease in bacterial numbers.

Bactericide - An agent which kills bacteria.

Flagella - Whip-like appendages used by bacteria singly or in number for mobility.

Inhibitor - An agent which slows or interferes with growth of bacteria.

Lysis - Dissolution of the living cells of bacteria.

Mutation - A sudden variation (change) in microorganisms. A transmissible variation that is likely to be permanent, seemingly arising suddenly and spontaneously.

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BIBLIOGRAPHIC DATA SHEET	1. Report No. EPA-R2-73-139	2. Leave Blank	3. Recipient's Accession No. Leave Blank
4. Title and Subtitle: Magnesia-Base Wet Scrubbing of Pulverized-Coal-Generated Flue Gas - Pilot Demonstration			5. Report Date: September 1970 6. Leave Blank
7. Author(s): W. Downs and A. J. Kubasco			8. Performing Organization Rept. No. (fill in)
9. Performing Organization Name and Address: The Babcock & Wilcox Company Research and Development Division Research Center Alliance, Ohio 44601			10. Project/Task/Work Unit No. Leave Blank 11. Contract/Grant No. CPA 22-69-162
12. Sponsoring Organization Name and Address: EPA, Air Pollution Control Office Technical Center, Box 12055 Research Triangle Park, N. C. 27709			13. Type of Report & Period Covered: Final Report 14. Leave Blank

15. Supplementary Notes

16. Abstracts

A project was conducted to demonstrate the adequacy of magnesia-base wet scrubbing to remove essentially all of the particulates and most of the sulfur dioxide from pulverized coal furnaces. Side effects such as sulfate formation, NO_x absorption, and scrubber operability were to be determined. A wet scrubbing pilot plant, which consisted of a venturi-type particulate scrubber, a venturi-type absorber, and a tray-type absorber, was designed and constructed. Over 100 short-term tests were performed to determine the most satisfactory operating conditions for each scrubber. The results indicate that the magnesia-base wet scrubbing process is superior to other wet processes known to be under development for abatement of both particulates and SO_2 from coal-fired furnaces.

SAMPLE

17. Key Words and Document Analysis. 17a. Descriptors

*Scrubbers
Pulverized fuels
Combustion products
*Air pollution
Combustion products
*Air pollution control equipment
Adsorption
*Adsorbents
Sulfur dioxide
Magnesium carbonates
Particles

17b. Identifiers/Open-Ended Terms

*Air pollution control
*Waste gas recovery
Magnesia-base scrubbers

17c. COSATI Field/Group: 7A, 13B

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1. Report No. | 2. **W**

4. Title: REHABILITATION OF A BRINE-POLLUTED AQUIFER,

5. Report Date

6.

8. Performing Organization Report No.

Fryberger, John S.

Engineering Enterprises
under contract to
Arkansas Division of Soil & Water Resources

14020 DLN

13. Type of Report and Period Covered

12. Sponsoring Organization **Environmental Protection Agency**

Environmental Protection Agency report
number EPA-R2-72-014, December 1972,

A detailed investigation was made of one (among several noted) incident where a fresh-water aquifer has been polluted by accepted disposal of oil-field brine through an "evaporation" pit (an unlined earthen pit) and later a faulty disposal well. The present extent of the brine pollution is one square mile, however it will spread to affect 4 1/2 square miles and will remain for over 250 years before being flushed naturally into the Red River. Detailed chemical analyses show changes in relative concentrations of constituents as the brine moves through the aquifer.

Several rehabilitation methods are evaluated in detail, including controlled pumping to the Red River and deep-well disposal. None of the methods that are both technically feasible and permissible show a positive public benefit-cost ratio.

Although real economic damage both present and future results from this brine pollution, rehabilitation is not now economically justified. The report emphasizes that greater effort is needed to prevent such pollution, which not only affects ground-water resources but also affects water quality in interstate streams. (Fryberger-Engineering Enterprises)

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17a Descriptors: *Ground-water, *Water pollution, *Pollution abatement, *Brine disposal, Water pollution sources, Water pollution control, Water pollution effects, Path of pollutants, Aquifers, Saline water--freshwater interfaces, Arkansas hydrology, Water chemistry, Water conservation, Waste water disposal.

17b Identifiers:

*Aquifer rehabilitation, Red River, Disposal wells, Disposal pits.

17c COWRR Field & Group: 05B

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